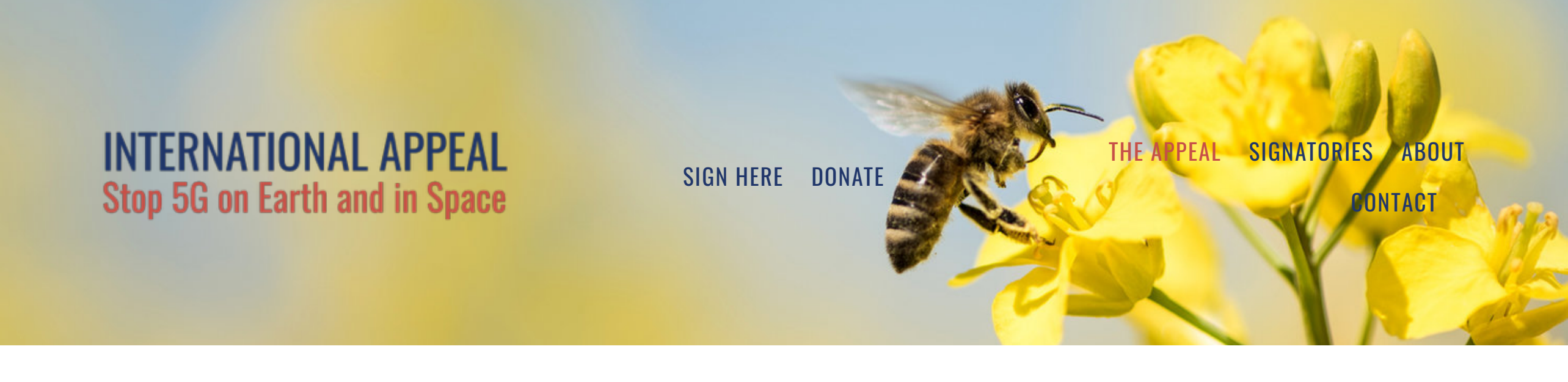

INTERNATIONAL APPEAL
Stop 5G on Earth and in Space

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There are 301,639 signatories from 215 nations and territories
as of July 12th, 2022

To the UN, WHO, EU, Council of Europe and governments of all nations

We the undersigned scientists, doctors, environmental organizations and citizens from (__) countries, urgently call for a halt to the deployment of the 5G (fifth generation) wireless network, including 5G from space satellites. 5G will massively increase exposure to radio frequency (RF) radiation on top of the 2G, 3G and 4G networks for telecommunications already in place. RF radiation has been proven harmful for humans and the environment. The deployment of 5G constitutes an experiment on humanity and the environment that is defined as a crime under international law.

Executive summary

Telecommunications companies worldwide, with the support of governments, are poised within the next two years to roll out the fifth-generation wireless network (5G). This is set to deliver what is acknowledged to be unprecedented societal change on a global scale. We will have “smart” homes, “smart” businesses, “smart” highways, “smart” cities and self-driving cars. Virtually everything we own and buy, from refrigerators and washing machines to milk cartons, hairbrushes and infants’ diapers, will contain antennas and microchips and will be connected wirelessly to the Internet. Every person on Earth will have instant access to super-high-speed, low- latency wireless communications from any point on the planet, even in rainforests, mid-ocean and the Antarctic.

What is not widely acknowledged is that this will also result in unprecedented environmental change on a global scale. The planned density of radio frequency transmitters is impossible to envisage. In addition to millions of new 5G base stations on Earth and 20,000 new satellites in space, 200 billion transmitting objects, according to estimates, will be part of the Internet of Things by 2020, and one *trillion* objects a few years later. Commercial 5G at lower frequencies and slower speeds was deployed in Qatar, Finland and Estonia in mid-2018. The rollout of 5G at extremely high (millimetre wave) frequencies is planned to begin at the end of 2018.

Despite widespread denial, the evidence that radio frequency (RF) radiation is harmful to life is already overwhelming. The accumulated clinical evidence of sick and injured human beings, experimental evidence of damage to DNA, cells and organ systems in a wide variety of plants and animals, and epidemiological evidence that the major diseases of modern civilization—cancer, heart disease and diabetes—are in large part caused by electromagnetic pollution, forms a literature base of well over 10,000 peer-reviewed studies.

If the telecommunications industry’s plans for 5G come to fruition, no person, no animal, no bird, no insect and no plant on Earth will be able to avoid exposure, 24 hours a day, 365 days a year, to levels of RF radiation that are tens to hundreds of times greater than what exists today, without any possibility of escape anywhere on the planet. These 5G plans threaten to provoke serious, irreversible effects on humans and permanent damage to all of the Earth’s ecosystems.

Immediate measures must be taken to protect humanity and the environment, in accordance with ethical imperatives and international agreements.

5G will result in a massive increase in inescapable, involuntary exposure to wireless radiation

Ground-based 5G

In order to transmit the enormous amounts of data required for the Internet of Things (IoT), 5G technology, when fully deployed, will use millimetre waves, which are poorly transmitted through solid material. This will require every carrier to install base stations every 100 metres[1] in every urban area in the world. Unlike previous generations of wireless technology, in which a single antenna broadcasts over a wide area, 5G base stations and 5G devices will have multiple antennas arranged in “phased arrays” [2],[3] that work together to emit focused, steerable, laser-like beams that track each other.

Each 5G phone will contain dozens of tiny antennas, all working together to track and aim a narrowly focused beam at the nearest cell tower. The US Federal Communications Commission (FCC) has adopted rules [4] permitting the effective power of those beams to be as much as 20 watts, ten times more powerful than the levels permitted for current phones.

Each 5G base station will contain hundreds or thousands of antennas aiming multiple laser-like beams simultaneously at all cell phones and user devices in its service area. This technology is called “multiple input multiple output” or MIMO. FCC rules permit the effective radiated power of a 5G base station’s beams to be as much as 30,000 watts per 100 MHz of spectrum,[2] or equivalently 300,000 watts per GHz of spectrum, tens to hundreds of times more powerful than the levels permitted for current base stations.

Space-based 5G

At least five companies[5] are proposing to provide 5G from space from a combined 20,000 satellites in low- and medium-Earth orbit that will blanket the Earth with powerful, focused, steerable beams. Each satellite will emit millimetre waves with an effective radiated power of up to 5 million watts[6] from thousands of antennas arranged in a phased array. Although the energy reaching the ground from satellites will be less than that from ground-based antennas, it will irradiate areas of the Earth not reached by other transmitters and will be additional to ground-based 5G transmissions from billions of IoT objects. Even more importantly, the satellites will be located in the Earth’s magnetosphere, which exerts a significant influence over the electrical properties of the atmosphere. **The alteration of the Earth’s electromagnetic environment may be an even greater threat to life than the radiation from ground-based antennas (see below).**

Harmful effects of radio frequency radiation are already proven

Even before 5G was proposed, dozens of petitions and appeals[7] by international scientists, including the Freiburger Appeal signed by over 3,000 physicians, called for a halt to the expansion of wireless technology and a moratorium on new base stations.[8]

In 2015, 215 scientists from 41 countries communicated their alarm to the United Nations (UN) and World Health Organization (WHO).[9] They stated that “numerous recent scientific publications have shown that EMF [electromagnetic fields] affects living organisms at levels well below most international and national guidelines”. More than 10,000 peer-reviewed scientific studies demonstrate harm to human health from RF radiation.[10] [11] Effects include:

- Alteration of heart rhythm[12]
- Altered gene expression[13]
- Altered metabolism[14]
- Altered stem cell development[15]
- Cancers[16]
- Cardiovascular disease[17]
- Cognitive impairment[18]
- DNA damage[19]
- Impacts on general well-being[20]
- Increased free radicals[21]
- Learning and memory deficits[22]
- Impaired sperm function and quality[23]
- Miscarriage[24]
- Neurological damage[25]
- Obesity and diabetes[26]
- Oxidative stress[27]

Effects in children include autism,[28] attention deficit hyperactivity disorder (ADHD)[29][30] and asthma.[31]

Damage goes well beyond the human race, as there is abundant evidence of harm to diverse plant- and wildlife[32][33] and laboratory animals, including:

- Ants[34]
- Birds[35][36]
- Forests[37]
- Frogs[38]
- Fruit flies[39]
- Honey bees[40]
- Insects[41]
- Mammals[42]
- Mice[43][44]
- Plants[45]
- Rats[46]
- Trees[47]

Negative microbiological effects[48] have also been recorded.

The WHO’s International Agency for Research on Cancer (IARC) concluded in 2011 that RF radiation of frequencies 30 kHz - 300 GHz are possibly carcinogenic to humans (Group 2B).[49] However, recent evidence, including the latest studies on cell phone use and brain cancer risks, indicate that RF radiation is proven carcinogenic to humans[50] and should now be classified as a “Group 1 carcinogen” along with tobacco smoke and asbestos.

Most contemporary wireless signals are pulse-modulated. Harm is caused by both the high-frequency carrier wave and the low-frequency pulsations.[51]

The deployment of 5G satellites must be prohibited

The Earth, the ionosphere and the lower atmosphere form the global electric circuit[52] in which we live. It is well established that biological rhythms—of humans,[53][54] birds,[55] hamsters,[56] and spiders[57][58]—are controlled by the Earth’s natural electromagnetic environment and that the well-being of all organisms depends on the stability of this environment, including the electrical properties of the atmosphere.[59][60][61][62] Cherry, in a groundbreaking paper, [63] explained the importance of the Schumann resonances[64] and why ionospheric disturbances can alter blood pressure and melatonin and cause “cancer, reproductive, cardiac and neurological disease and death”.

These elements of our electromagnetic environment have already been altered by radiation from power lines. Power line harmonic radiation[65] reaches the Earth’s ionosphere and magnetosphere, where it is amplified by wave-particle interactions.[66][67] In 1985, Dr. Robert O. Becker warned that power line harmonic radiation had already changed the structure of the magnetosphere, and that the continued expansion of this effect “threatens the viability of all life on Earth”.[68] The placement of tens of thousands of satellites directly in both the ionosphere and magnetosphere, emitting modulated signals at millions of watts and millions of frequencies, is likely to alter our electromagnetic environment beyond our ability to adapt.[69]

Informal monitoring has already provided evidence indicating serious effects on humans and animals from the approximately 100 satellites that have provided 2G and 3G phone service from low orbit since 1998. Such effects cannot be understood only from consideration of the low levels of radiation on the ground. Knowledge from other relevant scientific disciplines must be taken into account, including the fields of atmospheric physics and acupuncture.[70][71][72][73] Adding 20,000 5G satellites will further pollute the global electric circuit[74][75] and could alter the Schumann resonances,[76] with which all life on Earth has evolved. The effects will be universal and may be profoundly damaging.

5G is qualitatively and quantitatively different from 4G

The idea that we will tolerate tens to hundreds of times more radiation at millimetre wavelengths is based on faulty modelling of the human body as a shell filled with a homogeneous liquid.[77][78] The assumption that millimetre waves do not penetrate beyond the skin completely ignores nerves,[79] blood vessels[80][81] and other electrically conducting structures that can carry radiation-induced currents deep into the body.[82][83][84] Another, potentially more serious error is that phased arrays are not ordinary antennas. When an ordinary electromagnetic field enters the body, it causes charges to move and currents to flow. But when extremely short electromagnetic pulses enter the body, something else happens: the moving charges themselves become little antennas that reradiate the electromagnetic field and send it deeper into the body. These reradiated waves are called Brillouin precursors.[85] They become significant when either the power or the phase of the waves changes rapidly enough.[86] 5G will probably satisfy both criteria.

In addition, shallow penetration in itself poses a unique danger to eyes and to the largest organ of the body, the skin, as well as to very small creatures. Peer-reviewed studies have recently been published, predicting thermal skin burns[87] in humans from 5G radiation and resonant absorption by insects,[88] which absorb up to 100 times as much radiation at millimetre wavelengths as they do at wavelengths presently in use. Since populations of flying insects have declined by 75-80 per cent since 1989 even in protected nature areas,[89] 5G radiation could have catastrophic effects on insect populations worldwide. A 1986 study by Om Gandhi warned that millimetre waves are strongly absorbed by the cornea of the eye, and that ordinary clothing, being of millimetre-size thickness, increases the absorption of energy by the skin by a resonance-type effect.[90] Russell (2018) reviews the known effects of millimetre waves on skin, eyes (including cataracts), heart rate, immune system and DNA.[91]

Regulators have deliberately excluded the scientific evidence of harm

Stakeholders thus far in the development of 5G have been industry and governments, while renowned international EMF scientists who have documented biological effects on humans, animals, insects and plants, and alarming effects on health and the environment in thousands of peer-reviewed studies have been excluded. The reason for the current inadequate safety guidelines is that conflicts of interest of standard-setting bodies “due to their relationships with telecommunications or electric companies undermine the impartiality that should govern the regulation of Public Exposure Standards for non-ionizing radiation”. [92] Professor Emeritus Martin L. Pall lays out the conflicts of interest in detail, and the lists of important studies that have been excluded, in his literature review. [93]

The thermal hypothesis is obsolete—new safety standards are needed

Current safety guidelines are based on the obsolete hypothesis that heating is the only harmful effect of EMFs. As Markov and Grigoriev have stated, “Today standards do not consider the real pollution of the environment with nonionizing radiation”.[94] Hundreds of scientists, including many signatories to this appeal, have proven that many different kinds of acute and chronic illnesses and injuries are caused without heating (“non-thermal effect”) from radiation levels far below international guidelines.[9] Biological effects occur even at near-zero power levels. Effects that have been found at 0.02 picowatts (trillionths of a watt) per square centimetre or less include altered genetic structure in E. coli[95] and in rats,[96] altered EEG in humans,[97] growth stimulation in bean plants,[98] and stimulation of ovulation in chickens.[99]

To protect against non-thermal effects, duration of exposure must be considered. 5G will expose everyone to many more transmissions simultaneously and continuously, day and night without cessation. New safety standards are needed and should be based on *cumulative exposure* and *not only on power levels* but also on frequency, bandwidth, modulation, waveform, pulse width and other properties that are biologically important. Antennas must be confined to specific, publicly identified locations. To protect humans, antennas must be located far from where people live and work, and excluded from the public rights-of-way where people walk. To protect wildlife, they must be excluded from wilderness sanctuaries and strictly minimized in remote areas of the Earth. To protect all life, commercial communications satellites must be limited in number and prohibited in low- and medium-Earth orbits. Phased arrays must be prohibited on Earth and in space.

RF radiation has both acute and chronic effects

RF radiation has both immediate and long-term effects. Cancer and heart disease are examples of long-term effects. Alteration of heart rhythm[100] and changes in brain function (EEG)[101] are examples of immediate effects. A syndrome that was called radiowave sickness[102] in the former Soviet Union and is called electromagnetic hypersensitivity (EHS) around the world today[103] can be either acute or chronic. Professor Dr. Karl Hecht has published a detailed history of these syndromes, compiled from a review of more than 1,500 Russian scientific papers and the clinical histories of more than 1,000 of his own patients in Germany. Objective findings include sleep disorders, abnormal blood pressure and heart rate, digestive disorders, hair loss, tinnitus and skin rash. Subjective symptoms include dizziness, nausea, headache, memory loss, inability to concentrate, fatigue, flu-like symptoms and cardiac pain. [104]

The EUROPAEM EMF Guideline 2016 states that EHS develops when people are “continuously exposed in their daily life” to increasing levels of EMFs, and that “reduction and prevention of EMF exposure” is necessary to restore these patients to health.[105] EHS should no longer be considered a disease, but an injury by a toxic environment that affects an increasingly large portion of the population, estimated already at 100 million people worldwide,[106][107] and that may soon affect everyone[108] if the worldwide rollout of 5G is permitted.

The International Scientific Declaration on EHS and multiple chemical sensitivity (MCS), Brussels, declared in 2015 that “*[i]naction is a cost to society and is not an option any more…* [W]e unanimously acknowledge this serious hazard to public health… [urgently requiring] that major *primary prevention measures are adopted and prioritized, to face this worldwide pan-epidemic in perspective*” (emphasis added).[109]

World governments are failing in their duty of care to the populations they govern

In their haste to implement 5G and to encourage the unconstrained use of outer space, the European Union, United States and national governments worldwide are taking steps to ensure a “barrier-free” regulatory environment.[110] They are prohibiting local authorities from enforcing environmental laws,[111] and “in the interest of speedy and cost-effective deployment”, removing “unnecessary burdens… such as local planning procedures [and] the variety of specific limits on electromagnetic field (EMF) emissions and of the methods required to aggregate them”.[112]

Governments are also enacting laws to make wireless facilities a permitted use in all public rights-of-way.[113] To date, most wireless facilities have been located on private property at some distance from homes and businesses. In order for them to be spaced less than 100 metres apart as required by 5G, however, they will now be located on the sidewalk directly in front of homes and businesses and close above the heads of pedestrians, including mothers with babies.

Public notice requirements and public hearings are being eliminated. Even if there were a hearing and 100 scientific experts were to testify against 5G, laws have been passed making it illegal for local authorities to take their testimony into consideration. US law, for example, prohibits local governments from regulating wireless technology “on the basis of the environmental effects of radio frequency radiation”,[114] and courts have reversed regulatory decisions about cell tower placement simply because most of the public testimony was about health.[115] Insurers will not provide coverage against EMF risks,[116] and there is zero clarity as to what entity will bear legal responsibility for damage to life, limb and property arising from exposure to 5G, whether ground- or space-based.[117]

In the absence of an agreed comprehensive legal regime governing activities in outer space, legal liability for those activities is non-existent, despite the prospect of whole continents, the atmosphere and the oceans being put at risk by them.

International agreements are being violated

Children and duty of care

The United Nations Convention on the Rights of the Child: States shall “undertake to ensure the child such protection and care as is necessary for his or her well-being” (art. 3), “ensure… the survival and development of the child” (art. 6) and “take appropriate measures to combat disease… taking into consideration the dangers and risks of environmental pollution” (art. 24(c)).

The Nuremberg Code (1947) applies to all experiments on humans, thus including the deployment of 5G with new, higher RF radiation exposure that has not been pre-market tested for safety. “The voluntary consent of the human subject is absolutely essential” (art. 1). Exposure to 5G will be involuntary. “No experiment should be conducted, where there is an a priori reason to believe that death or disabling injury will occur” (art. 5). The findings of over 10,000 scientific studies and the voices of hundreds of international organizations representing hundreds of thousands of members who have suffered disabling injury and been displaced from their homes by already-existing wireless telecommunications facilities, are “a priori reasons to believe that death or disabling injury will occur”.

Duty to inform and EMFs

The World Telecommunication Standardization Assembly (2012) of the International Telecommunication Union (ITU) stated that “[t]here is a need to inform the public of the potential effects of exposure to electromagnetic fields (EMFs)” and invited Member States “to adopt suitable measures in order to ensure compliance with relevant international recommendations to protect health against the adverse effect of EMF”.

The Mid-term review of the European Environment and Health Action Plan 2004-2010 (2008): “The European Parliament… [n]otes that the limits on exposure to electromagnetic fields which have been set for the general public are obsolete, … obviously take no account of developments in information and communication technologies, of the recommendations issued by the European Environment Agency or of the stricter emission standards adopted, for example, by Belgium, Italy and Austria, and do not address the issue of vulnerable groups, such as pregnant women, newborn babies and children.”

Resolution 1815 (Council of Europe, 2011): “Take all reasonable measures to reduce exposure to electromagnetic fields, especially to radio frequencies from mobile phones, and particularly the exposure to children and young people.”

Environment

The Declaration of the United Nations Conference on the Human Environment (1972): “The discharge of toxic substances… in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems” (principle 6).

The World Charter for Nature (1982): “Activities which are likely to cause irreversible damage to nature shall be avoided… [W]here potential adverse effects are not fully understood, the activities should not proceed” (art. 11).

The Rio Declaration on Environment and Development (1992): “States have… the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction” (principle 2).

The United Nations World Summit on Sustainable Development (2002): “There is an urgent need to… create more effective national and regional policy responses to environmental threats to human health” (para. 54(k)).

The African Convention on the Conservation of Nature and Natural Resources (2017): “The Parties shall… take all appropriate measures to prevent, mitigate and eliminate to the maximum extent possible, detrimental effects on the environment, in particular from radioactive, toxic, and other hazardous substances and wastes” (art. 13).

Health and human rights

The Universal Declaration of Human Rights (1948): “Everyone has the right to life, liberty and security of person” (art. 3).

The United Nations Global Strategy for Women’s, Children’s and Adolescents’ Health (2016-2030) has as objectives and targets to “transform”, by expanding enabling environments; to “survive”, by reducing maternal and newborn mortality; and to “thrive” by ensuring health and well-being and reducing pollution-related deaths and illnesses.

Space

The Outer Space Treaty (1967) requires that the use of outer space be conducted “so as to avoid [its] harmful contamination and also adverse changes in the environment of the Earth” (art. IX)

The United Nations Guidelines for The Long-Term Sustainability of Outer Space Activities (2018): “States and international intergovernmental organizations should address… risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects” (guideline 2.2(c)).

World governments are playing dice with life on Earth

Albert Einstein famously asserted that “God does not play dice”.[118] Yet by pursuing the broadcast on Earth and from space of 5G, world governments are recklessly playing dice with the future of life on Earth.

To refuse to accept and apply relevant and valid scientific knowledge is ethically unacceptable. Existing research shows that 5G—and especially space-based 5G—contravenes principles enshrined in a host of international agreements.

We call upon the UN, WHO, EU, Council of Europe and governments of all nations,

(a) *To take* immediate measures to halt the deployment of 5G on Earth and in space in order to protect all humankind, especially the unborn, infants, children, adolescents and pregnant women, as well as the environment;

(b) *To follow* the United Nations Convention on the Rights of the Child and Council of Europe Resolution 1815 by informing citizens, including teachers and physicians, about the health risks (to adults and children) from RF radiation, and why they should and how they can avoid wireless communication and base stations, particularly in or near day-care centres, schools, hospitals, homes and workplaces;

(c) *To favour and implement* wired telecommunications instead of wireless;

(d) *To prohibit* the wireless/telecommunications industry through its lobbying organizations from persuading officials to make decisions permitting further expansion of RF radiation, including ground- and space-based 5G;

(e) *To appoint* immediately—without industry influence—international groups of independent, truly impartial EMF and health scientists with no conflicts of interest, [119] for the purpose of establishing new international safety standards for RF radiation that are not based only on power levels, that consider cumulative exposure, and that protect against *all* health and environmental effects, not just thermal effects and not just effects on humans;

(f) *To appoint* immediately—without industry influence—international groups of scientists with expertise in EMFs, health, biology and atmospheric physics, for the purpose of developing a comprehensive regulatory framework that will ensure that the uses of outer space are safe for humans and the environment, taking into account RF radiation, rocket exhaust gases, black soot, and space debris and their impacts on ozone, [120] global warming, [121] the atmosphere and the preservation of life on Earth. Not only ground-based but also space-based technology must be sustainable [122] for adults and children, animals and plants.

Please respond to the Appeal Administrator listed below,

detailing the measures you intend to take to protect the global population against RF radiation exposure, especially 5G radiation. This appeal and your response will be publicly available on www.5gSpaceAppeal.org.

Respectfully submitted,

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SIGN IT
(INDIVIDUAL)

SIGN IT
(ORGANIZATION)

References

[1] De Grasse M. AT&T outlines 5G network architecture. RCR Wireless News, Oct. 20, 2016. https://www.rcrwireless.com/20161020/network-infrastructure/att-outlines-5g-network-architecture-tag4. Accessed July 9, 2018.

[2] Hong W, Jiang ZH, Yu C, et al. Multibeam antenna technologies for 5G wireless communications. IEEE Tr Ant Prop. 2017;65(12):6231-6249. doi: 10.1109/TAP.2017.2712819.

[3] Chou H-T. Design Methodology for the Multi-Beam Phased Array of Antennas with Relatively Arbitrary Coverage Sector. Conference paper: 2017 11th European Conference on Antennas and Propagation; Paris, France. doi: 10.23919/EuCAP.2017.7928095.

[4] 47 CFR § 30.202 — Power limits.

[5] SpaceX, WorldVu, Boeing, Telesat Canada, and Iridium.

[6] Federal Communications Commission. Pending Application for Satellite Space and Earth Station Authorization. Schedule S, Technical Report. Dated April 2016, filed March 1, 2017. http://licensing.fcc.gov/myibfs/download.do?attachment_key=1200245. Accessed June 17, 2018.

[7] Governments and organizations that ban or warn against wireless technology. Cellular Phone Task Force website. http://www.cellphonetaskforce.org/governments-and-organizations-that-ban-or-warn-against-wireless-technology/. Accessed June 10, 2018. Continually updated.

[8] The International Doctors´ Appeal (Freiburger Appeal). https://www.cellphonetaskforce.org/wp-content/uploads/2021/07/Freiburger-Appeal-English.pdf. Published in 2012. Accessed June 10, 2018.

[9] International appeal: scientists call for protection from non-ionizing electromagnetic field exposure. International EMF Scientist Appeal website. https://emfscientist.org/index.php/emf-scientist-appeal. Published May 11, 2015. Accessed June 10, 2018. As of March 2018, 237 EMF scientists from 41 nations had signed the Appeal.

[10] Glaser Z. Cumulated index to the bibliography of reported biological phenofmena ('effects') and clinical manifestations attributed to microwave and radio-frequency radiation: report, supplements (no. 1-9).BEMS newsletter (B-1 through B-464), 1971-1981. http://www.cellphonetaskforce.org/wp-content/uploads/2018/06/Zory-Glasers-index.pdf. Accessed June 26, 2018. Report and 9 supplements issued by Naval Medical Research Institute, Bethesda, MD; Research Division, Bureau of Medicine & Surgery, Dept. of the Navy, Washington, DC; Electromagnetic Radiation Project Office, Naval Medical Research & Development Command, Bethesda, MD; Naval Surface Weapons Center, Dahlgren, VA; and National Institute for Occupational Safety and Health, Rockville, MD. Index by Julie Moore and Associates, Riverside, CA, 1984. Lt. Zorach Glaser, PhD, catalogued 5,083 studies, books and conference reports for the US Navy through 1981.

[11] Sage C, Carpenter D., eds. BioInitiative Report: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Radiation. Sage Associates; 2012. www.bioinitiative.org. Accessed June 10, 2018. The 1,470-page BioInitiative Report, authored by an international group of 29 experts, has reviewed more than 1,800 new studies and is continually updated.

[12] Grigoriev Y. Bioeffects of modulated electromagnetic fields in the acute experiments (results of Russian researches). Annu Russ Natl Comm Non-Ionising Radiat Protect. 2004:16-73. http://bemri.org/publications/biological-effects-of-non-ionizing-radiation/78-grigoriev-bioeffects07/file.html. Accessed June 17, 2018.

[13] Obajuluwa AO, Akinyemi AJ, Afolabi OB, et al. Exposure to radio-frequency electromagnetic waves alters acetylcholinesterase gene expression, exploratory and motor coordination-linked behaviour in male rats.Toxicol Rep. 2017;4:530-534. https://www.sciencedirect.com/science/article/pii/S221475001730063X/pdfft?md5=0af5af76124b1f89f6d23c90c5c7764f&pid=1-s2.0-S221475001730063X-main.pdf. Accessed June 17, 2018.

[14] Volkow ND, Tomasi D, Wang G-J, et al. Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. JAMA. 2012;305(8):808-813. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3184892. Accessed June 17, 2018.

[15] Eghlidospour M, Ghanbari A, Mortazavi S, Azari H. Effects of radiofrequency exposure emitted from a GSM mobile phone on proliferation, differentiation, and apoptosis of neural stem cells. Anat Cell Biol. 2017;50(2):115-123. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5509895. Accessed June 17, 2018.

[16] Hardell L, Carlberg C. Mobile phones, cordless phones and the risk for brain tumors. Int J Oncol.2009;35(1):5-17. https://www.spandidos-publications.com/ijo/35/1/5/download. Accessed June 17, 2018.

[17] Bandara P, Weller S. Cardiovascular disease: Time to identify emerging environmental risk factors. Eur J Prev Cardiol. 2017;24(17):1819-1823. http://journals.sagepub.com/doi/10.1177/2047487317734898. Accessed June 17, 2018.

[18] Deshmukh P et al. Cognitive impairment and neurogenotoxic effects in rats exposed to low-intensity microwave radiation. Int J Toxicol. 2015;34(3):284-290. doi: 10.1177/1091581815574348.

[19] Zothansiama, Zosangzuali M, Lalramdinpuii M, Jagetia GC. Impact of radiofrequency radiation on DNA damage and antioxidants in peripheral blood lymphocytes of humans residing in the vicinity of mobile phone base stations. Electromag Biol Med. 2017;36(3):295-305. doi: 10.1080/15368378.2017.1350584.

[20] Zwamborn A, Vossen S, van Leersum B, Ouwens M, Mäkel W. Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints. TNO Report FEL-03-C148. The Hague: TNO Physics and Electronics Laboratory; 2003. http://www.milieugezondheid.be/dossiers/gsm/TNO_rapport_Nederland_sept_2003.pdf. Accessed June 16, 2018.

[21] Havas M. When theory and observation collide: Can non-ionizing radiation cause cancer? Environ Pollut. 2017;221:501-505. doi: 10.1016/j.envpol.2016.10.018.

[22] Narayanan SN, Kumar RS, Potu BK, Nayak S, Mailankot M. Spatial memory performance of Wistar rats exposed to mobile phone. Clinics. 2009;64(3):231-234. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2666459. Accessed June 17, 2018.

[23] Houston BJ, Nixon B, King BV, De Iuliis GN, Aitken RJ. The effects of radiofrequency electromagnetic radiation on sperm function. Reproduction. 2016;152(6):R263-R266. http://www.reproduction-online.org/content/152/6/R263.long. Accessed June 17, 2018.

[24] Han J, Cao Z, Liu X, Zhang W, Zhang S. Effect of early pregnancy electromagnetic field exposure on embryo growth ceasing. Wei Sheng Yan Jiu. 2010;39(3):349-52 (in Chinese). https://www.ncbi.nlm.nih.gov/pubmed/20568468.

[25] Salford LG, Brun AE, Eberhardt JL, Malmgren L, Persson BRR. Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones. Environ Health Perspect. 2003;111(7):881-883. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241519/pdf/ehp0111-000881.pdf. Accessed June 17, 2018.

[26] Milham S. Evidence that dirty electricity is causing the worldwide epidemics of obesity and diabetes. Electromagn Biol Med. 2014;33(1):75-78. doi: 10.3109/15368378.2013.783853.

[27] Yakymenko I, Tsybulin O, Sidorik E, Henshel D, Kyrylenko O, Kyrylenko S. Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. Electromagn Biol Med. 2016;35(2):186-202. doi: 10.3109/15368378.2015.1043557.

[28] Herbert M, Sage C. Findings in autism (ASD) consistent with electromagnetic fields (EMF) and radiofrequency radiation (RFR). In: Sage C, Carpenter D., eds. BioInitiative Report: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Radiation. Sec. 20. Sage Associates; 2012. http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf. Accessed June 29, 2018.

[29] Divan HA, Kheifets L, Obel C, Olsen J. Prenatal and postnatal exposure to cell phone use and behavioral problems in children. Epidemiology 2008;19: 523–529. http://www.wifiinschools.com/uploads/3/0/4/2/3042232/divan_08_prenatal_postnatal_cell_phone_use.pdf. Accessed June 29, 2018.

[30] Divan HA, Kheifets L, Obel C, Olsen J. Cell phone use and behavioural problems in young children. J Epidemiol Community Health. 2010;66(6):524-529. doi: 10.1136/jech.2010.115402. Accessed July 16, 2018.

[31] Li D-K, Chen H, Odouli R. Maternal exposure to magnetic fields during pregnancy in relation to the risk of asthma in offspring. Arch Pediatr Adolesc Med. 2011;165(10):945-950. https://jamanetwork.com/journals/jamapediatrics/fullarticle/1107612. Accessed June 29, 2018.

[32] Warnke U. Bees, Birds and Mankind: Destroying Nature by ‘Electrosmog.’ Competence Initiative for the Protection of Humanity, Environment and Democracy; 2009. http://www.bemri.org/publications/wildlife-and-plants/1-birds-bees-and-mankind/file.html. Accessed March 11, 2020.

[33] Balmori A. Electromagnetic pollution from phone masts. Effects on wildlife. Pathophysiology. 2009;16:191-199. doi:10.1016/j.pathophys.2009.01.007. Accessed June 10, 2018.

[34] Cammaerts MC, Johansson O. Ants can be used as bio-indicators to reveal biological effects of electromagnetic waves from some wireless apparatus. Electromagn Biol Med. 2014;33(4):282-288. doi: 10.3109/15368378.2013.817336.

[35] Broomhall M. Report detailing the exodus of species from the Mt. Nardi area of the Nightcap National Park World Heritage Area during a 15-year period (2000-2015). Report for the United Nations Educational Scientific and Cultural Organization (UNESCO). https://ehtrust.org/wp-content/uploads/Mt-Nardi-Wildlife-Report-to-UNESCO-FINAL.pdf. Accessed June 17, 2018.

[36] Kordas D. Birds and Trees of Northern Greece: Changes since the Advent of 4G Wireless. 2017. https://einarflydal.files.wordpress.com/2017/08/kordas-birds-and-trees-of-northern-greece-2017-final.pdf. Accessed June 29, 2018.

[37] Waldmann-Selsam C, Balmori-de la Puente A, Breunig H, Balmori A. Radiofrequency radiation injures trees around mobile phone base stations. Sci Total Environ. 2016;572:554-569. doi: 10.1016/j.scitotenv.2016.08.045.

[38] Balmori A. Mobile phone mast effects on common frog (Rana temporaria) tadpoles: The city turned into a laboratory. Electromagn Biol Med. 2010(1-2):31-35. doi: 10.3109/15368371003685363.

[39] Margaritis LH, Manta AK, Kokkaliaris KD, et al. Drosophila oogenesis as a bio-marker responding to EMF sources. Electromagn Biol Med. 2014;33(3):165-189. doi: 10.3109/15368378.2013.800102.

[40] Kumar NR, Sangwan S, Badotra P. Exposure to cell phone radiations produces biochemical changes in worker honey bees. Toxicol Int. 2011;18(1):70-72. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3052591. Accessed June 17, 2018.

[41] Balmori A. Efectos de las radiaciones electromagnéticas de la telefonía móvil sobre los insectos.Ecosistemas. 2006;15(1):87-95. https://www.revistaecosistemas.net/index.php/ecosistemas/article/download/520/495. Accessed June 17, 2018.

[42] Balmori A. The incidence of electromagnetic pollution on wild mammals: A new “poison” with a sloweffect on nature? Environmentalist. 2010;30(1):90-97. doi: 10.1007/s10669-009-9248-y

[43] Magras IN, Xenos TD. RF radiation-induced changes in the prenatal development of mice.Bioelectromagnetics 1997;18(6):455-461. http://collectiveactionquebec.com/uploads/8/0/9/7/80976394/exhibit_r-62_magras_mice_study.pdf. Accessed June 17, 2018.

[44] Otitoloju AA, Osunkalu VO, Oduware R, et al. Haematological effects of radiofrequency radiation from GSM base stations on four successive generations (F1 – F4) of albino mice, Mus Musculus. J Environ Occup Sci. 2012;1(1):17-22. https://www.ejmanager.com/mnstemps/62/62-1332160631.pdf?t=1532966199. Accessed July 30, 2018.

[45] Magone I. The effect of electromagnetic radiation from the Skrunda Radio Location Station on Spirodela polyrhiza (L.) Schleiden cultures. Sci Total Environ. 1996;180(1):75-80. doi: 0048-9697(95)04922-3.

[46] Nittby H, Brun A, Strömblad S, et al. Nonthermal GSM RF and ELF EMF effects upon rat BBB permeability.Environmentalist. 2011;31(2):140-148. doi: 10.1007/s10669-011-9307-z.

[47] Haggerty K. Adverse influence of radio frequency background on trembling aspen seedlings: Preliminary observations. International Journal of Forestry Research. 2010; Article ID 836278. http://downloads.hindawi.com/journals/ijfr/2010/836278.pdf. Accessed June 17, 2018.

[48] Taheri M, Mortazavi SM, Moradi M, et al. Evaluation of the effect of radiofrequency radiation emitted from Wi-Fi router and mobile phone simulator on the antibacterial susceptibility of pathogenic bacteria Listeria monocytogenes and Escherichia coli. Dose Response. 2017;15(1):1559325816688527. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5298474. Accessed June 18, 2018.

[49] International Agency for Research on Cancer. Non-ionizing radiation, part 2: radiofrequency electromagnetic fields. In: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Vol 102. Lyon, France: WHO Press; 2013. http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf. Accessed July 2, 2018.

[50] Carlberg M, Hardell L. Evaluation of mobile phone and cordless phone use and glioma risk using the Bradford Hill viewpoints from 1965 on association and causation. Biomed Res Int. 2017:9218486. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5376454. Accessed June 17, 2018.

[51] Blackman CF. Evidence for disruption by the modulating signal. In: Sage C, Carpenter D., eds. BioInitiative Report: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Radiation. Sec. 15. Sage Associates; 2012. http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec15_2007_Modulation_Blackman.pdf. Accessed June 19, 2018.

[52] Williams ER. The global electrical circuit: a review. Atmos Res. 2009;91(2):140-152. doi:10.1016/j.atmosres.2008.05.018.

[53] Wever R. Human circadian rhythms under the influence of weak electric fields and the different aspects of these studies. Int J Biometeorol. 1973;17(3):227-232. www.vitatec.com/docs/referenz-umgebungsstrahlung/wever-1973.pdf. Accessed June 10, 2018.

[54] Wever R. ELF-effects on human circadian rhythms. In: ELF and VLF Electromagnetic Field Effects. (Persinger M, ed.) New York: Plenum; 1974:101-144.

[55] Engels S, Schneider N-L, Lefeldt N, et al. Anthropogenic electromagnetic noise disrupts magnetic compass orientation in a migratory bird. Nature. 2014;509:353-356. doi:10.1038/nature13290.

[56] Ludwig W, Mecke R. Wirkung künstlicher Atmospherics auf Säuger. Archiv für Meteorologie, Geophysik und Bioklimatologie Serie B (Archives for Meteorology Geophysics and Bioclimatology Series B Theoretical and Applied Climatology). 1968;16(2-3):251-261. doi:10.1007/BF02243273.

[57] Morley EL, Robert D. Electric fields elicit ballooning in spiders. Current Biology. 2018;28:1-7. https://www.cell.com/current-biology/pdf/S0960-9822(18)30693-6.pdf. Accessed July 14, 2018.

[58] Weber J. Die Spinnen sind Deuter des kommenden Wetters (Spiders Are Predictors of the Coming Weather). 1800; Landshut, Germany. "The electrical material works always in the atmosphere; no seasoncan retard its action. Its effects on the weather are almost undisputed; spiders sense it, and alter theirbehaviour accordingly."

[59] König H. Biological effects of extremely low frequency electrical phenomena in the atmosphere. J Interdiscipl Cycle Res. 2(3):317-323. www.tandfonline.com/doi/abs/10.1080/09291017109359276. Accessed June 10, 2018.

[60] Sulman F. The Effect of Air Ionization, Electric Fields, Atmospherics, and Other Electric Phenomena On Man and Animal. American lecture series. Vol 1029. Springfield, Ill: Thomas; 1980.

[61] König HL, Krüger, AP, Lang S, Sönning, W. Biologic Effects of Environmental Electromagnetism. New York: Springer-Verlag; 1981. doi: 10.1007/978-1-4612-5859-9.

[62] Sazanova E, Sazanov A, Sergeenko N, Ionova V, Varakin Y. Influence of near earth electromagnetic resonances on human cerebrovascular system in time of heliogeophysical disturbances. Progress in Electromagnetics Research Symposium. August 2013:1661-1665.

[63] Cherry N. Schumann resonances, a plausible biophysical mechanism for the human health effects of solar/geomagnetic activity. Natural Hazards. 2002;26(3):279-331. doi:10.1023/A:1015637127504.

[64] Polk C. Schumann resonances. In Volland H, ed. CRC Handbook of Atmospherics. Vol. 1. Boca Raton, Fla: CRC Press; 1982:111-178. https://archive.org/stream/in.ernet.dli.2015.132044/2015.132044.Crc-Handbook-Of-Atmospherics-Vol-1#page/n115/mode/2up/search/polk. Accessed June 18, 2018.

[65] Park C, Helliwell R. Magnetospheric effects of power line radiation. Science. 1978;200(4343):727-730. doi:10.1126/science.200.4343.727.

[66] Bullough K, Kaiser TR, Strangeways HJ. Unintentional man-made modification effects in the magnetosphere. J Atm Terr Phys. 1985;47(12):1211-1223.

[67] Luette JP, Park CG, Helliwell RA. The control of the magnetosphere by power line radiation. J Geophys Res. 1979;84:2657-2660.

[68] Becker RO, Selden G. The Body Electric: Electromagnetism and the Foundation of Life. New York: Morrow; 1985:325-326.

[69] Firstenberg A. Planetary Emergency. Cellular Phone Task Force website. http://www.cellphonetaskforce.org/planetary-emergency. Published 2018. Accessed June 10, 2018.

[70] Becker RO. The basic biological data transmission and control system influenced by electrical forces. Ann NY Acad Sci. 1974;238:236-241. doi: 10.1111/j.1749-6632.1974.tb26793.x.

[71] Maxey ES, Beal JB. The electrophysiology of acupuncture; How terrestrial electric and magnetic fields influence air ion energy exchanges through acupuncture points. International Journal of Biometeorology. 1975;19(Supp. 1):124. doi:10.1007/BF01737335.

[72] Ćosić I, Cvetković D, Fang Q, Jovanov E, Lazoura H. Human electrophysiological signal responses to ELFSchumann resonance and artificial electromagnetic fields. FME Transactions. 2006;34:93-103. http://scindeks-clanci.ceon.rs/data/pdf/1450-8230/2006/1450-82300602093C.pdf. Accessed July 18, 2018.

[73] Cohen M, Behrenbruch C, Ćosić I. Is there a link between acupuncture meridians, earth-ionosphere resonances and cerebral activity? Proceedings of the 2nd International Conference on Bioelectromagnetism, Melbourne, Australia. 1998:173-174. doi: 10.1109/ICBEM.1998.666451.

[74] Chevalier G, Mori K, Oschman JL. The effect of earthing (grounding) on human physiology. European Biology and Bioelectromagnetics. January 2006:600-621. http://162.214.7.219/~earthio0/wp-content/uploads/2016/07/Effects-of-Earthing-on-Human-Physiology-Part-1.pdf. Accessed June 10, 2018. "Highly significant EEG, EMG and BVP results demonstrate that restoring the natural electrical potential of the earth to the human body (earthing) rapidly affects human electrophysiological and physiological parameters. The extreme rapidity of these changes indicates a physical/bioelectrical mechanism ratherthan a biochemical change."

[75] Firstenberg A. Earth's Electric Envelope. In: The Invisible Rainbow: A History of Electricity and Life. Santa Fe, NM: AGB Press; 2017: 113-131.

[76] Cannon PS, Rycroft MJ. Schumann resonance frequency variations during sudden ionospheric disturbances. J Atmos Sol Terr Phys. 1982;44(2):201-206. doi:10.1016/0021-9169(82)90124-6.

[77] Technical Report. European Telecommunications Standards Institute; 2007:7. http://www.etsi.org/deliver/etsi_tr/125900_125999/125914/07.00.00_60/tr_125914v070000p.pdf. Accessed June 10, 2018. "The Specific Anthropomorphic Mannequin (SAM) is used for radiated performancemeasurements [and is] filled with tissue simulating liquid."

[78] Research on technology to evaluate compliance with RF protection guidelines. Electromagnetic Compatibility Laboratory, Tokyo. http://emc.nict.go.jp/bio/phantom/index_e.html. Accessed July 18, 2018."SAR is measured by filling phantom liquid that has the same electrical properties as those of the human body in a container made in the shape of the human body, and scanning the inside using an SAR probe."

[79] Becker RO, Marino AA. Electromagnetism and Life. Albany: State University of New York Press; 1982:39."The evidence seems to be quite conclusive that there are steady DC electric currents flowing outside of the neurones proper in the entire nervous system."

[80] Nordenström B. Biologically Closed Electric Circuits. Stockholm: Nordic Medical Publications; 1983.

[81] Nordenström B. Impact of biologically closed electric circuits (BCEC) on structure and function. Integr Physiol Behav Sci. 1992;27(4):285-303. doi:10.1007/BF02691165.

[82] Devyatkov ND, ed. Non-Thermal Effects of Millimeter Radiation. Moscow: USSR Acad. Sci.; 1981 (Russian).

[83] Devyatkov ND, Golant MB, Betskiy OV. Millimeter Waves and Their Role in the Processes of Life. (Millimetrovye volny i ikh rol' v protsessakh zhiznedeyatel'nosti). Moscow: Radio i svyaz' (Radio and Communication); 1991 (Russian).

[84] Betskii OV. Biological effects of low-intensity millimetre waves (Review). Journal of Biomedical Electronics. 2015(1):31-47. http://www.radiotec.ru/article/15678. Accessed July 31, 2018.

[85] Albanese R, Blaschak J, Medina R, Penn J. Ultrashort electromagnetic signals: Biophysical questions,safety issues and medical opportunities," Aviat Space Environ Med. 1994;65(5 Supp):A116-A120. http://www.dtic.mil/dtic/tr/fulltext/u2/a282990.pdf. Accessed June 18, 2018.

[86] Pepe D, Aluigi L, Zito D. Sub-100 ps monocycle pulses for 5G UWB communications. 10th European Conference on Antennas and Propagation (EuCAP). 2016;1-4. doi: 10.1109/EuCAP.2016.7481123.

[87] Nasim I, Kim S. Human exposure to RF fields in 5G downlink. arXiv:1711.03683v1.https://arxiv.org/pdf/1711.03683. Accessed June 17, 2018.

[88] Thielens A, Bell D, Mortimore DB. Exposure of insects to radio-frequency electromagnetic fields from 2 to 120 GHz. Nature/Scientific Reports. 2018;8:3924. https://www.nature.com/articles/s41598-018-22271-3.pdf. Accessed June 17, 2018.

[89] Hallmann CA, Sorg M, Jongejans E. More than 75 per cent decline over 27 years in total flying insect biomass in protected areas. PLOS One. 2017;12(10):e0185809. http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0185809&type=printable. Accessed June 17, 2018.

[90] Gandhi O, Riazi A. Absorption of millimeter waves by human beings and its biological implications. IEEE Trans Microw Theory Tech. 1986;34(2):228-235. doi:10.1109/TMTT.1986.1133316.

[91] Russell CL. 5G wireless telecommunications expansion: Public health and environmental implications. Environ Res 2018;165:484-495. https://zero5g.com/wp-content/uploads/2018/07/5-G-wireless-telecommunications-expansion-Public-health-and-environmental-implications-Cindy-L.-russell.pdf. Accessed November 1, 2018.

[92] Hardell L. World Health Organization, radiofrequency radiation and health—a hard nut to crack (review). Int J Oncol. 2017;51:405-413. doi:10.3892/ijo.2017.4046.

[93] Pall M. 5G: Great risk for EU, U.S. and international health: Compelling evidence for eight distinct types of great harm caused by electromagnetic field (EMF) exposures and the mechanism that causes them. European Academy for Environmental Medicine. http://www.5gappeal.eu/wp-content/uploads/2018/06/pall_2018.pdf. Published May 2018. Accessed June 22, 2018.

[94] Markov M, Grigoriev Y. Wi-Fi technology: An uncontrolled global experiment on the health of mankind,Electromagn Biol Med. 2013;32(2):200-208. http://www.avaate.org/IMG/pdf/Wi-fi_Technology_-_An_Uncontrolled_Global_Experiment_on_the_Health_of_Mankind_-_Marko_Markov_Yuri_G._Grigoriev.pdf. Accessed June 23, 2018.

[95] Belyaev I, Alipov Y, Shcheglov V, Polunin V, Aizenberg O. Cooperative response of Escherichia coli cells to the resonance effect of millimeter waves at super low intensity. Electromagn Biol Med. 1994;13(1):53-66. doi:10.3109/15368379409030698.

[96] Belyaev I. Nonthermal biological effects of microwaves: Current knowledge, further perspective, and urgent needs. Electromagn Biol Med. 2005;24(3):375-403. doi:10.1080/15368370500381844.

[97] Bise W. Low power radio-frequency and microwave effects on human electroencephalogram and behavior. Physiol Chem Phys. 1978;10(5):387-398.

[98] Brauer I. Experimentelle Untersuchungen über die Wirkung von Meterwellen verschiedener Feldstärke auf das Teilungswachstum der Pflanzen. Chromosoma. 1950;3(1):483-509. doi:10.1007/BF00319492.

[99] Kondra P, Smith W, Hodgson G, Bragg D, Gavora J, Hamid M. Growth and reproduction of chickens subjected to microwave radiation. Can J Anim Sci. 1970;50(3):639-644. doi:10.4141/cjas70-087.

[100] Frey AH, Seifert E. Pulse modulated UHF energy illumination of the heart associated with change in heart rate. Life Sciences. 1968;7(10 Part 2):505-512. doi: 10.1016/0024-3205(68)90068-4.

[101] Mann K, Röschke J. Effects of pulsed high-frequency electromagnetic fields on human sleep.Neuropsychobiology. 1996;33(1):41-47. doi: 10.1159/000119247.

[102] Tiagin NV. Clinical aspects of exposure to microwave radiation. Moscow: Meditsina; 1971 (Russian).

[103] Belpomme D, Campagnac C, Irigaray P. Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder. Rev Environ Health 2015;30(4):251–271. https://www.jrseco.com/wp-content/uploads/Belpomme-Environmental-health-2015.pdf. Accessed June 18, 2018.

[104] Hecht K. Health Implications of Long-term Exposure to Electrosmog. Competence Initiative for the Protection of Humanity, the Environment and Democracy. 2016: 16, 42-46. https://kompetenzinitiative.com/wp-content/uploads/2019/08/KI_Brochure-6_K_Hecht_web.pdf. Accessed November 19, 2019.

[105] Belyaev I, Dean A, Eger H, et al. EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Rev Environ Health. 2016;31(3):363-397. doi:10.1515/reveh-2016-0011.

[106] Schreier N, Huss A, Röösli M. The prevalence of symptoms attributed to electromagnetic field exposure: A cross-sectional representative survey in Switzerland. Soz Praventivmed. 2006;51(4):202-209. doi:10.1007/s00038-006-5061-2. Accessed July 16, 2018.

[107] Schroeder E. Stakeholder-Perspektiven zur Novellierung der 26. BImSchV: Ergebnisse der bundesweitenTelefonumfrage im Auftrag des Bundesamtes für Strahlenschutz (Report on stakeholder perspectives onamending the 26th Federal Emission Control Ordinance: Results of the nationwide telephone survey ordered by the Federal Office for Radiation Protection). Schr/bba 04.02.26536.020. Munich, Germany. 2002 (German). https://www.bfs.de/SharedDocs/Downloads/BfS/DE/berichte/emf/befuerchtungen.pdf?__blob=publicationFile&v=3. Accessed July 19, 2018.

[108] Hallberg Ö, Oberfeld G. Letter to the editor: Will we all become electrosensitive? Electromagn Biol Med.2006;25:189-191. https://www.criirem.org/wp-content/uploads/2006/03/ehs2006_hallbergoberfeld.pdf. Accessed June 22, 2018.

[109] Brussels International Scientific Declaration on Electromagnetic Hypersensitivity and Multiple Chemical Sensitivity. ECRI Institute. http://eceri-institute.org/fichiers/1441982765_Statement_EN_DEFINITIF.pdf. Published 2015. Accessed June 10, 2018.

[110] Removal of barriers to entry, 47 U.S.C. § 253. https://www.gpo.gov/fdsys/pkg/USCODE-2015-title47/pdf/USCODE-2015-title47-chap5-subchapII-partII-sec253.pdf; 5G For Europe: An Action Plan. European Commission; 2016. http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131. Accessed June 10, 2018.

[111] Federal Register – Rules and Regulations. 47 CFR Part 1 [WT Docket No 17–79; FCC 18–30] Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment. 2018;83(86). Accessed June 10, 2018.

[112] 5G For Europe: An Action Plan. European Commission; 2016. http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131. Accessed June 10, 2018.

[113] PCIA – The Wireless Infrastructure Association. Model wireless telecommunications facility siting ordinance. 2012. https://wia.org/wp-content/uploads/Advocacy_Docs/PCIA_Model_Zoning_Ordinance_June_2012.pdf. Accessed June 29, 2018.

[114] Mobile services, 47 U.S.C. § 332(c)(7)(B)(iv). https://www.gpo.gov/fdsys/pkg/USCODE-2016-title47/pdf/USCODE-2016-title47-chap5-subchapIII-partI-sec332.pdf: "No state or local government or instrumentality thereof may regulate personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [Federal Communications] Commission's regulations concerning such emissions." Courts have reversed regulatory decisions about cell tower placement simply because most of the public testimony was about health.

[115] Cellular Telephone Company v. Town of Oyster Bay, 166 F.3d 490, 495 (2nd Cir. 1999). https://openjurist.org/166/f3d/490/cellular-telephone-company-at-v-town-of-oyster-bay. Accessed June 10, 2018.; T-Mobile Northeast LLC v. Loudoun County Bd. of Sup'rs, 903 F.Supp.2d 385, 407 (E.D.Va. 2012). https://caselaw.findlaw.com/us-4th-circuit/1662394.html. Accessed June 10, 2018.

[116] Vogel G. A Coming Storm For Wireless? TalkMarkets. July 2017. http://talkmarkets.com/content/stocks--equities/a-coming-storm-for-wireless?post=143501&page=2. Accessed September 13, 2018.

[117] Swiss Re: SONAR - New emerging risk insights. July 2014:22. http://media.swissre.com/documents/SONAR_2014.pdf. Accessed June 10, 2018. "[A]n increasing level of interconnectivity and the growing prevalence of digital steering and feedback systems also give rise to new vulnerabilities. These could involve cascading effects with multiple damages as well as long-lasting interruptions if the problems turned out to be complex and/or difficult to repair. Interconnectivity and permanent data generation give rise to concerns about data privacy, and exposure to electromagnetic fields may also increase."

[118] Albert Einstein, letter to Max Born, Dec. 4, 1926.

[119] Conflicts of interest have frequently arisen in the past. For example, the EU Commission (2008/721/EC) appointed industry-supportive members for SCENIHR who submitted to the EU a misleading SCENIHR report on health risks, which gave the telecommunications industry carte blanche to irradiate EU citizens. The report is now quoted by radiation safety agencies in the EU. Another example is the US National Toxicology Program contracting with the IT'IS Foundation, which is funded by the entire telecommunications industry, to design, build and monitor the exposure facility for a two-year, 25-million-US-dollar study of cell phones. It subsequently produced a misleading report that is now quoted by industry officials in the US.

[120] Ross M, Mills M, Toohey D. Potential climate impact of black carbon emitted by rockets. Geophys Res Lett. 2010;37:L24810. https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2010GL044548. Accessed June 17, 2018.

[121] Ross MN, Schaeffer PM. Radiative forcing caused by rocket engine emissions. Earth's Future. 2014;2:177-196. https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2013EF000160. Accessed June 17, 2018.

[122] Callicott JB, Mumford K. Ecological sustainability as a conservation concept. Conservation Biology. 1997;11(1):32-40. https://www.sierraforestlegacy.org/Resources/Community/Sustainability/SY_CallicottMumford1997.pdf. Accessed June 20, 2018.

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